

**Ball Tossing Apparatus and Method**

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**BACKGROUND OF THE INVENTION****Field Of The Invention:**

10 The present invention relates generally to sports training devices, and more particularly to a ball tossing apparatus and method used to train a sports player to hit air-born objects. Even more, particularly the present invention is used to improve the batting skills of a baseball/softball player.

**Description of the Background Art:**

15 The game of baseball has been an American favorite for well over a century. Developing the skills required to play the game of baseball takes time, and continuous training on the part of the player. Batting, a skill required to be a valuable baseball player, is often one of the most difficult to learn because of its complex nature. For example, a batter must repeatedly execute consistent setup and stride at the plate. Additionally, an experienced batter will be able to  
20 selectively hit to different field positions. Finally, the batter must develop excellent hand-eye coordination, so as to be able to hit a ball at many varied pitch locations.

Many devices have been presented in the prior art that provide batting practice by vertically tossing baseballs to a batter. These devices, however, require frequent reloading, and/or manual release of the baseball in a manner detrimental to proper skill development of the  
25 batter. For example, in U.S. Patent No. 4,865,318, issued September 12, 1989 to Lehmann et al., the batter must frequently reload the ball tossing device, and must depress a foot pedal to launch

the ball, which could hinder consistent stride and stance development. Another example is U.S. Patent No. 5,221,081, issued June 22, 1993 to Rooks. Rooks discloses a batter training apparatus that randomly releases balls to the batter. According to Rooks a plurality of launchers are arranged linearly in relation to one another. This linear arrangement results in incomplete coverage of the strike zone. Further, the release mechanism of Rooks is such that two or more balls may be released simultaneously, thereby wasting valuable practice time.

What is needed is a ball tossing apparatus that releases balls in a variety of locations, in a controlled manner, without disrupting the action of the hitter. What is also needed is a baseball training apparatus that is convenient to use and transport.

### SUMMARY

The present invention overcomes the problems associated with the prior art by providing a novel ball tossing apparatus and method that sequentially launches a plurality of balls to a sports player. The balls are launched vertically, according to a launch sequence, from a plurality of launch devices that are arranged in a two-dimensional array.

In a particular embodiment of the present invention, a ball tossing apparatus includes a support frame and a plurality of launch devices that are fixed to the support frame and arranged in a two-dimensional array. Each launch device includes a biasing member for projecting a ball from the launch device, and a release device for retaining the biasing member in a loaded position, and for releasing the biasing member to project the ball. In a more particular embodiment, the launch device is a cylinder, the biasing member is a coil spring fixed within the cylinder, and the release device is a solenoid. A ball carrier is coupled to the coil spring, and

includes at least one engaging structure for engaging the solenoid. Optionally, the carrier may include a conical interior surface for carrying balls of varying diameters.

In one particular embodiment, the support frame is rectangular, and has a base, sides, and a top deck, with the plurality of launch devices being disposed below the top deck. Optionally, a portion of the interior of the support frame may be used for ball storage. An optional handle, coupled to the support frame, facilitates transportation of the ball tossing apparatus. In a more particular embodiment, the support frame includes indicia of a home plate that is optionally adjustable in position.

In the disclosed embodiment the ball tossing apparatus includes an electronic control system. The control system includes a processing unit for executing data and code, and memory for storing the data and code. The code includes a launch module for sequentially activating the plurality of launch devices.

An optional user interface facilitates user interaction with the electronic control system. Examples of user input devices include, but are not limited to, a keypad, a remote control, selector switches, etc.. Examples of user feedback devices include, but are not limited to, a speaker, a display device, etc..

In certain embodiments with a user interface, the launch module, responsive to instructions from the user is operative to execute a predetermined launch sequence. For example, the user interface enables the user to input and store a launch sequence. As another example, the user interface enables the user to select a randomly generated launch sequence. As yet another example, the user can select a launch sequence from a plurality of predefined launch sequences via the user interface.

In a more particular embodiment, the launch module, responsive to a launch instruction received from the user is operative to activate a single one of the launch devices. For example, in one embodiment, the launch module is operative to activate the next one of the launch devices, responsive to each launch instruction, according to a predetermined launch sequence. As another  
5 example, the launch module, responsive to each subsequently received launch instruction, is operative to activate a next one of the launch devices depending on a value of the received launch instruction.

In a particular embodiment, the remote control provides launch instructions from the user to the electronic control system. For example, the remote control may include a pattern of buttons corresponding to the layout of the launch devices. When one of the buttons on the remote control is depressed, launch instructions are sent to the electronic control system to activate the corresponding launch device. As another example, the remote control can also include other input devices such as a numeric keypad, selector buttons, etc.

In an alternate embodiment, the ball tossing apparatus does not include a user interface, and the launch module activates the plurality of launch devices according to a randomly  
15 generated launch sequence, or according to a predefined launch sequence.

A particular method of the present invention includes the steps of loading a plurality of balls into a corresponding plurality of launch devices arranged in a two dimensional array, and launching the plurality of balls according to a launch sequence. Balls are loaded in one of a  
20 plurality of loaded positions depending on the desired launch height.

In one particular method, the step of launching the balls includes selecting a launch sequence. Selecting the launch sequence may include one or more of receiving a launch sequence from the user, generating a random launch sequence, or retrieving a predefined launch

sequence from memory. Optionally, a sequence received from the user can be stored to memory as a predefined sequence for later retrieval.

BRIEF DESCRIPTION OF THE DRAWINGS

- 5           FIG.1 shows a baseball player using one embodiment of a ball tossing apparatus of the present invention for batting practice;
- FIG. 2 shows a top view of the ball tossing apparatus of FIG. 1;
- FIG. 3 is a cross-sectional view of the ball tossing apparatus of FIG. 2 taken along section line A-A;
- FIG. 4 shows a rear wall view of the ball tossing apparatus of FIG. 1;
- FIG. 5 shows a block diagram of an electronic control system for use in the present invention;
- FIG. 6 is a flowchart showing one example method of sequentially launching balls according to the present invention;
- 15          FIG. 7 is a flowchart showing one example method of performing the sixth step (load launch sequence) of the flowchart of FIG. 6;
- FIG. 8 is a flowchart showing one method of performing the seventh step (release balls) of the flowchart of FIG. 6; and
- FIG. 9 shows an alternate ball carrier for use in the present invention.

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DETAILED DESCRIPTION

The present invention overcomes the problems associated with the prior art, by providing a novel system and method for launching balls to a sports player. In the following description,

numerous specific details are set forth (e.g. remote controlled ball launch, a ball storage compartment, solenoid release mechanisms, etc.) in order to provide a thorough understanding of the invention. Those skilled in the art will recognize, however, that the invention may be practiced apart from these specific details. In other instances, details of well-known practices (e.g. software programming, mechanical construction, electrical wiring, etc.) have been omitted, so as not to unnecessarily obscure the present invention.

FIG. 1 shows a ball tossing apparatus 100 used to provide batting practice to a batter 102. Ball tossing apparatus 100 includes a support frame 104 that rigidly encases a plurality of launch devices 106(1-n). In the depicted embodiment, launch devices 106(1-n) are disposed substantially vertically within support frame 104. Several of launch devices 106(1-n) (e.g. launch device 106(1)) are shown loaded with baseballs 108(1-n) ready to be launched. Launch devices 106(1-n) are distributed throughout support frame 104 in a two-dimensional array, to cover many areas of the strike zone of batter 102. Baseball 108(n) is shown to have been launched vertically. Launch devices 106(1-n) that are empty are presumed to have already launched their respective baseballs 108(1-n), or optionally were not loaded by batter 102.

Arranging launch devices 106(1-n) in a two-dimensional array provides many advantages over the prior art. For example, baseballs 108(1-n) are launched into the air in a variety of pitch locations (e.g. outside, inside, high, and low) that realistically simulate live game-play. Additionally, baseballs 108(1-n) that are launched in front of or behind batter 102 teach him/her to hit a pitch early (forward launch) and late (behind launch). By hitting pitches in a variety of locations, batter 102 will learn consistent setup and stride, to hit to any position on the field, patience at the plate while batting, and an overall awareness of their individual strike zone. As

yet another example, ball tossing apparatus 100, because of it's large two-dimensional array of launch devices 106(1-n), requires infrequent reloading.

Ball tossing apparatus 100 further includes relational indicia 110 located on a top deck 112 of ball tossing apparatus 100. In the depicted embodiment, indicia 110 is a home plate 114 with two apertures 116 formed therein to facilitate the launch of two of baseballs 108(1-n) through home plate 114. In this particular embodiment, home plate 114 can be placed at any position on top deck 112 so long as home plate 114 does not cover loaded ones of launch devices 106(1-n). Optionally, indicia 110 can be painted on top deck 112. In yet another alternate embodiment, indicia 110 is embodied in a wire frame to minimize interference with launch devices 106(1-n).

Disposing launch devices 106(1-n) below top deck 112 provides a variety of advantages. For example, top deck 112 provides a protective barrier against dirt and debris. As another example, top deck 112 sturdies launch devices 106(1-n) and prevents them from damage possibly caused by a misdirected swing of the baseball bat, or from being stepped on by a careless player. As yet another example, disposing launch devices 106(1-n) below top deck 112 creates a compact, aesthetically pleasing appearance of ball tossing apparatus 100.

It should be noted that baseball is not the only sport that would benefit from the instant invention. For example softball or cricket players could utilize ball tossing apparatus 100 for batting practice just as easily as baseball players. Additionally, tennis players learning serving techniques or ball return techniques would also benefit from the present invention. For purposes of clarity and consistency, however, the instant invention will continue to be described with respect only to baseball.

FIG. 2 shows a top view of ball tossing apparatus 100. Ball tossing apparatus 100 is shown representationally to further include a ball storage compartment 202, an electronic control system 204, a power supply 206, a start switch 208, and a handle 210. Support frame 104, in addition to top deck 112, includes a rear wall 212, a front wall 214, a left side wall 216, a right side wall 218, and a base not visible in the view of FIG. 2. Ball storage compartment 202 is formed in the interior space of support frame 104 and is designed to hold a supply of baseballs for use with ball tossing apparatus 100. An access door (not shown) formed in support frame 104 provides access to ball storage compartment 202. As shown in FIG. 2, ball storage compartment 202 is rectangular in shape, but it should be understood that other shapes (e.g. a cylindrical tube, etc.) could be used. Further, in an alternate embodiment, storage compartment 202 is embodied in a detachable tube that can be secured to the outside of support frame 104.

Electronic control system 204 controls and coordinates the launch of balls 108(1-n) from launch devices 106(1-n). A more detailed description of the operation of control system 204 will be provided hereinafter. Electronic control system 204 is powered by power supply 206. Power supply 206 includes one or more standard disposable batteries or a rechargeable battery pack. Those skilled in the art will realize that power supply 206 may be replaced and/or augmented with an adapter capable of receiving and converting power from an alternate power supply.

Start switch 208 provides an initiate signal to electronic control system 204 to commence the launch of baseballs 108(1-n). Start switch 208 is located to facilitate easy activation by a user. For example, batter 102 could simply depress start switch 208 with his foot or the end of his baseball bat. After a short delay to allow the batter to set up, electronic control system 204 sequentially provides launch signals to launch devices 106(1-n) to launch baseballs 108(1-n). A



handle 210 is also fixed to support frame 104 to facilitate easy transportation of ball tossing apparatus 100.

It should be noted that although ball tossing apparatus 100 is shown to be portable, ball tossing apparatus 100 may also be fixed or manufactured into a permanent structure such as in the floor of a batting cage, in place of home plate in a little league baseball or softball field, or in a portion of a sports stadium to provide batting practice or warm up hitting. Those skilled in the art will realize that if ball tossing apparatus 100 is implemented in a permanent structure certain components could be omitted (e.g. handle 210) or replaced (e.g. hard wiring instead of power supply 206, etc.).

FIG. 3 shows a cross-sectional view of ball tossing apparatus 100 taken along section line A-A of FIG. 2. Support frame 104 is now further shown to include a base 302, and top deck 112 is shown to include shoulder stops 304(1-n). Base 302, left side wall 216, right side wall 218, rear wall 212, front wall 214, and top deck 112 are fabricated from a sturdy, light-weight material such as fiberglass reinforced resin board, plastic, or other material. Launch devices 106(1-n) (106(1-3) shown) are fixed to and encased by support frame 104. Launch devices 106(1-n) can be fixed to the support frame in any number of ways (e.g. adhesive, fasteners, etc.) or can be integrally formed in top deck 112. It should be understood, however, that it is not essential that launch devices 106(1-n) be fixed within support frame 104, and can, in fact, be situated outside of or protrude from support frame 104.

Each of launch devices 106(1-n) comprises a cylinder 306(1-n), a biasing member 308(1-n), a carrier 310(1-n), and a release device 314(1-n), respectively. In the depicted embodiment biasing member 308(1-n) comprises a large diameter (but small enough to travel within cylinders 306(1-n)) coil spring. However, it should be understood that alternate biasing means including,

but not limited to elastic bands, stretched springs, compressed air, etc. can be used to provide baseballs 108(1-n) with enough kinetic energy to obtain a satisfactory launch height. Biasing member 308 is coupled to carrier 310 (e.g. via fasteners, adhesive, welding, etc.). Carrier 310(1) is guided by and travels within cylinder 306(1), and carries baseball 108(1) as it is accelerated upwardly. Carrier 310(1) is stopped by shoulder stop 304(1) and baseball 108(1) is launched from launch device 106(1). In this embodiment, shoulder stops 304(1-n) are provided by making the openings in top deck 112 smaller than the carriers 310(1-n). Cylinders 306(1-n) and carriers 310(1-n) are made of a PVC plastic or other strong, lightweight material. In the embodiment shown carriers 310(1-n) are formed as a cup-shaped piece of PVC plastic. However, carrier 310(1) can optionally be formed in other shapes including, but not limited to a circular flat plate, a convex plate, a concave plate, or other such structure that provides similar functionality.

Carrier 310(1) further includes a plurality of engaging structures 312(1) that are engaged by release device 314(1) when carrier 310(1) is pressed down into cylinder 306(1) during loading. Release device 314(1) engages one of engaging structures 312(1) thereby retaining biasing member 308(1) in a compressed position, and disengages engaging structure 312(1) to allow biasing member 308(1) to project ball 108(1) out of launch device 106(1). In this example embodiment, release device 314(1) includes a solenoid, controlled by electronic control system 204, with engaging member 316(1), and a return spring 318(1). Responsive to a launch signal from control system 204, the solenoid retracts engaging member 316(1) to release biasing member 308(1). Return spring 318(1) returns engaging member 316(1) to an engaging position when the solenoid is deactivated.

The use of multiple engaging structures 312(1) facilitates multiple loaded positions having varying amounts of spring compression, thus providing various launch heights of baseball

108(1). The height ball 108(1) attains depends on which of engaging structures 312(1) is engaged by release device 314(1). A desired launch height is selected by batter 102 when loading ball tossing apparatus 100. Varying launch heights ensure that the entire vertical strike zone is covered and batters of varying heights will be able to hit baseball 108(1). Each of the other launch devices 106(2-n) operate in substantially the same manner.

Launch devices 106(1-n) are shown to launch baseballs 108(1-n) vertically. In an alternate embodiment, one or more of launch devices 106(1-n) may be tilted slightly off the vertical axis in order to simulate a curve ball or other breaking pitch.

FIG. 4 shows rear wall 212 of support frame 104 showing ball storage compartment 202, electronic control system 204, and power supply 206 in greater detail. Ball storage compartment 202 includes an access door 402, hinges 404, and a latch 406. Access door 402 provides access to ball storage compartment 202, and is coupled to base 218 by hinges 404. Latch 406 is adapted to engage top deck 112 to retain access door in a closed position. Optionally latch 406 includes a keyed lock to prevent theft of any balls stored within ball storage compartment 202.

Electronic control system 204 is also shown to include a plurality of user interface devices that include a power switch 408, a speaker 410, a select key 412, an enter key 414, and numeric keys 416(0-9). Power switch 408 allows a user to select one of two modes of operation, by sliding switch 408 from the “off” position to either the “on” or “manual” position. Speaker 410 provides audible feedback from electronic control system 204 to batter 102. For example, when electronic control system 204 is powered, speaker 410 would issue a sound (e.g. a particular tone, synthesized speech, etc.) to indicate to batter 102 that electronic control system is ready to function. As another example, control system 204 can issue audible tones via speaker

410 to acknowledge receipt of keypad entries. Optionally, a display (e.g. an LED display) can be included among the interface devices to provide additional feedback from control system.

Select key 412 is used by batter 102 to cycle through available launch modes (e.g. random launch, user programmed launch, predefined launch, etc.) when power switch 408 is in the "on" position. When cycling through each available launch mode, speaker 410 would issue an associated audible signal to indicate that a particular launch mode is selected. Batter 102 can then select a desired launch mode by depressing enter key 414. Enter key 414 serves as a general execution key for electronic control system 204. Batter 102 can use enter key 414 to perform such functions as accepting a launch mode, issuing commands to electronic control system 204, selecting a predetermined launch sequence, etc. Numeric keys 416(0-9) are used by batter 102 to input launch data into electronic control system 204. Launch data includes, but is not limited to launch sequences, predefined launch sequence identifiers, particular launch device identifiers, etc.

Electronic control system 204 further includes an infrared port 418 and a remote control 420. Infrared port 418 receives infrared signals from remote control 420. Remote control 420 facilitates remote operation of electronic control system 204, for example by a coach. All of the user input interfaces of electronic control system 204 may optionally be incorporated into remote control 420 as desired.

Remote control 420 further includes a ball launch schematic 422 having associated launch buttons 424(1-n) for each of respective launch devices 106(1-n). Ball launch schematic 422 can be used to program a launch sequence by depressing launch buttons 424(1-n) in the desired sequence. Additionally, when electronic control system 204 is operating in manual mode (i.e. when power switch 408 is in the "Man." position) each of baseballs 108(1-n) can be

launched individually when electronic control system 204 receives an associated launch signal from remote control 420. Additionally, a baseball 108(n) could be launched by the remote controller (e.g. the coach of batter 102) simply by depressing the associated launch button 424(n) on remote control 420. This feature would allow a baseball coach to simulate the selective pitch placement batters face when at bat against a pitcher.

An optional protective cover (not shown) protects the input/output interfaces of control system 204 from accidental damage, dust, and debris. In the present embodiment, the protective cover would be transparent to permit transmission of infrared signals through the protective cover so that the infrared signals can be received by infrared port 418.

The user input/output interfaces shown in this particular embodiment are by way of example only. No particular user interface is considered to be an essential element of the present invention. Rather, various user interfaces may be employed depending on the particular desired functionality of control system 204.

Start button 208 is also shown in this view to be depressable by batter 102 using either his foot or his bat. Start button 208 begins the launch sequence in either the computer controlled or manual operation mode. Optionally, electronic control system 204 will only launch a subsequent one of balls 108(1-n) each time start button 208 is depressed.

Power supply 206 is shown to further include an AC adapter 426. AC adapter 426 provides power to power supply 206 by engaging a conventional wall outlet 428. AC adapter 426 is detachable from power supply 206 at adapter plug fitting 430 to ensure the portability of ball tossing apparatus 100. In an alternate embodiment, when ball tossing apparatus 100 is incorporated into a permanent structure (e.g. the floor of a batting cage, a little league field, etc.)

power supply 206 can be eliminated and ball tossing apparatus 100 can be connected to a permanent power supply existing in the structure.

FIG. 5 shows a block diagram of electronic control system 204. Electronic control system 204 includes a processing unit 502, a user interface 504, a launch interface 506, and a memory device 508, all interconnected via system bus 509. Memory 508 stores data and code for execution by processing unit 502. Processing unit 502 processes and executes the data and code stored in memory 508 to impart functionality to control system 204. User I/O 504 represents the interface devices shown in FIG. 4 and/or any other user interfaces (e.g. an LED display) that may be necessary or desirable for use with a particular embodiment of the present invention. Launch interface 506 transmits launch signals, under the control of processing unit 502, to the appropriate launch devices 106(1-n) at the appropriate times.

Memory 508 is shown in this example as a single block. It should be understood, however, that memory 508 may include one or more types of memory. For example, working memory (e.g. SRAM, SDRAM, etc.) allows processing unit 502 to store and manipulate data and code during operation. Non-volatile memory (e.g. ROM, PROM, EPROM, etc.) stores and retains data and/or code even when control system 204 is powered down. Code stored in such non-volatile memory can be executed directly, or transferred to working memory when control system 204 is turned on. Further, other types of non-volatile data storage may be used, including, but not limited to hard disks, floppy disks, optical disks, or any other computer readable media. For the foregoing reasons, memory 508 is understood to include any hardware, software, firmware, or any combination thereof capable of providing the memory functions necessary to support any particular embodiment of the present invention.

Memory 508 includes a launch module 510, a loaded sequence 512, a random sequence generator 514, and a plurality of predefined sequences 516 (1-n). Launch module 510 provides overall control and coordination of the operations taking place within electronic control system 204. Loaded sequence 512 is a block of memory used to store the active launch sequence to be executed by launch module 510. When electronic control system 204 is powered up, loaded sequence 512 is initially empty, but can optionally be loaded with a default sequence at startup. Random sequence generator 514 is operative to generate random launch sequences. Predefined sequences 516(1-n) include stored release sequences that have been programmed at the time of manufacture and/or sequences that have been defined by a user (e.g. batter 102) and stored. Predefined sequences 516(1-n) are selected by batter 102 using sequence identifiers 517(1-n). In the present embodiment, each of sequence identifiers 517(1-n) is a single number that uniquely identifies an associated one of predefined sequences 516(1-n). Batter 102 can select any one of predefined sequences 516(1-n) by entering the associated sequence identifier 517(1-n) via numeric keys 416 (0-9), or, optionally, by stepping through the list of sequences.

Launch module 510 carries out the operative functions of electronic control system 204 when activated by batter 102 or another user. In one mode of operation, launch module 510 retrieves a selected one of launch sequences 516(1-n), loads the retrieved launch sequence into loaded sequence 512, and sequentially transmits launch signals, via launch interface 506, to launch devices 106(1-n) according to loaded sequence 512. In another mode of operation, responsive to instructions from batter 102, launch module 510 instructs random sequence generator 514 to generate a random launch sequence, loads the random sequence into loaded sequence 512, and transmits sequential launch signals according to the random launch sequence. Launch module 510 is further operative to retrieve a predefined launch sequence 516(1-n) and

load it as loaded sequence 512. In yet another mode of operation, launch module 510 receives a launch sequence programmed from batter 102 via User I/O 504, and stores the entered sequence as another predefined sequence 516(n+1) for later use. In yet another mode of operation, launch module 510 transmits each successive launch signal in the sequence only upon receipt of launch instructions from batter 102 or another user (e.g. a coach, a friend, etc.), via user I/O 504.

Launch interface 506 transmits launch signals to launch devices 106(1-n) as follows. Responsive to receipt of a launch signal (e.g. an address corresponding to one of launch devices 106(1-n)) from launch module 510, launch interface 506 asserts an electrical signal on a corresponding one of a plurality of control lines 518(1-n). Each of control lines 518(1-n) is coupled to one of a plurality of switches 520(1-n). Each of switches 520(1-n) selectively couples with a respective one of solenoids 314(1-n) to a power supply and thereby energizes one of solenoids 314(1-n) responsive to the launch signal being asserted on the corresponding one of control lines 518(1-n). The energized one of solenoids 314(1-n) launches the associated baseball 108 as described above with respect to FIG. 3.

A variety of switches are suitable for use as switches 520(1-n). For example, switches 520(1-n) can be simple power transistors. Alternately, switches 520(1-n) can be electromechanical switches.

FIG. 6 is a flowchart summarizing one method 600 of launching a plurality of baseballs 108(1-n), using ball tossing apparatus 100. In a first step 602 batter 102 loads launch devices 106(1-n) with baseballs 108(1-n) to their desired launch heights. Then in second step 604, if launch module 510, determines whether power switch 408 is to manual mode. If so, then in a third step 606 launch module 510 checks for the receipt of a first launch instruction from a user (e.g. batter 102, a coach, a friend, etc.) received via User I/O 504. If a launch instruction has



been received, then in fourth step 608, launch module 510 transmits a launch signal, via interface 506, to launch the ball from a launch device 106(1-n) corresponding to the launch instruction. Then in a fifth step 610, launch module 510 determines if all of baseballs 108(1-n) have been launched. If all baseballs 108(1-n) have been launched then method 600 ends. Otherwise, method 600 returns to step 606 and waits for the next launch instruction. If in step 606, launch module 510 determines that no launch instruction has been received, then launch module 510 waits for a launch instruction to be received via User I/O 504.

If in second step 604, launch module 510 determines that Power switch 408 is not set to manual mode (i.e. is set to "on" position), then in a sixth step 612, launch module 510 loads a launch sequence into the loaded sequence 512 memory block. Next, in a seventh step 614, launch module 510 transmits launch signals via launch interface 506 to sequentially launch baseballs 108(1-n) according to loaded sequence 512. After all of baseballs 108(1-n) are launched, method 600 ends.

FIG. 7 is a flowchart summarizing one method 700 of performing sixth step 612 (load launch sequence) of method 600. In a first step 702 launch module 510 determines whether batter 102 has indicated (via user I/O 504) that he/she wants baseballs 108(1-n) launched in a random order. If random mode is selected, then in a second step 704 random sequence generator 514 generates a random launch sequence. Then in a third step 706 launch module 510 loads the random launch sequence into loaded sequence 512 and method 700 ends.

If, in second step 702, launch module 510 determines that batter 102 does not want a random launch sequence, then in a fourth step 708 launch module 510 determines whether batter 102 wants to load one of predefined sequences 516(1-n). If so, then in a fifth step 710 launch module 510 receives a predefined sequence identifier from batter 102 via User I/O 504. Then, in

a sixth step 712, launch module 510 retrieves one of predefined sequences 516(1-n) corresponding to the received identifier from memory 508. Then, method 700 proceeds to third step 706, and loads the retrieved predefined sequence 516(n) into loaded sequence 512 and method 700 ends.

5 If, in fourth step 708, launch module 510 determines that batter 102 does not want to load one of predefined launch sequences 516(1-n), then method 700 proceeds to a seventh step 714, where launch module 510 determines whether batter 102 wants to program their own launch sequence. If launch module 510 determines that batter 102 wants to program a launch sequence, then in an eighth step 716 launch module 510 receives the launch sequence from batter 102 via user I/O 504. Then in a ninth step 718, launch module 510 determines if batter 102 wants to store their programmed sequence as one of predefined sequence 516(n-1) for later retrieval. If batter 102 wants to store the programmed sequence, then in a tenth step 720 launch module 510 stores the programmed sequence as predefined sequences 516(n+1) so that it can be later recalled by batter 102, and method 700 returns to step 702. Otherwise, method 700 proceeds to step 706 and launch module 510 loads the programmed sequence into loaded sequence 512.

If in seventh step 714 launch module 510 determines that batter 102 does not want to define a sequence then method 700 returns to first step 702.

FIG. 8 shows a flowchart summarizing one method 800 of performing the seventh step 614 (release balls) of method 600. In a first step 802, launch module 510 determines if batter 102 wants an automatic launch of baseballs 108(1-n). If batter 102 does want an automatic launch then in a second step 804, launch module 510 launches the first of baseballs 108(1-n) as indicated by loaded sequence 512. Then in a third step 806 launch module 510 waits a predetermined amount of time for the batter to reset himself and be ready for a subsequent ball

launch. Next, in a fourth step 808, launch module 510 determines if the last of baseballs 108(1-n) was launched. If all of baseballs 108(1-n) have been launched then method 800 ends.

Otherwise, method 800 returns to second step 804.

If in first step 802 launch module 510 determines that batter 102 does not want launch module 510 to automatically launch baseballs 108(1-n), then method 800 proceeds to a fifth step 810. In fifth step 810 launch module 510 waits to receive a launch instruction from batter 102, or another user (e.g. a coach) wishing to control the launch sequence. When launch module 510 receives a launch instruction then method 800 proceeds to a sixth step 812, where launch module 510 waits a predetermined time period, then in a seventh step 814 launch module 510 launches the first one of baseballs 108(1-n) in the loaded sequence 512. Then in eighth step 816 launch module determines if the last of baseballs 108(1-n) has been launched. If the last of baseballs 108(1-n) has been launched method 800 ends. Otherwise, method 800 returns to fifth step 810 to wait for an instruction to launch the next one of balls 108(1-n).

FIG. 9 shows a cross-section of an alternate carrier 900 which can be substituted for carriers 310(1-n). Carrier 900 is modified from carriers 310(1-n) to include a graduated cup portion 902. Graduated cup portion 902 includes a series of concentric, stepped rings 904 (1-n) forming an inverted cone shape extending up and out from the bottom, center of cup portion 902. Graduated cup portion 902 permits carrier 900 to hold balls of varying diameter. For example, carrier 900 is capable of retaining balls from as small as a Ping-Pong ball to as large as a softball, whereas carriers 310(1-n) were designed to hold balls of a particular diameter. Additionally, stepped rings 904(1-n) prevent balls from wedging into graduated cup portion 902, which might happen if graduated cup portion 902 had a smooth side wall.

The description of particular embodiments of the present invention is now complete.

Many of the described features may be substituted, altered or omitted without departing from the scope of the invention. For example, one embodiment of the present invention may be built into a permanent structure. As another example, alternate means for propelling baseballs 108(1-n) into the air, including but not limited to, compressed air, rubber bands, etc. may be substituted for coil springs 308(1-n). Further, other types of release mechanisms may be substituted for solenoids 314(1-n). As yet another example, alternate launch device layouts (e.g. outside the strike zone) can be used. These and other deviations from the particular embodiments shown will be apparent to those skilled in the art, particularly in view of the foregoing disclosure.

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